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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/071,596	02/08/2002	Roy Dean Meece	120399	2720

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EXAMINER	
CADUGAN, ERICA E	
ART UNIT	**PAPER NUMBER**
3722	6

DATE MAILED: 01/26/2004

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary	Application No.	Applicant(s)	
	10/071,596	MEECE ET AL.	
	Examiner	Art Unit	
	Erica E Cadugan	3722	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *31 October 2003*.

2a)☒ This action is **FINAL**. 2b)☐ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-21* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1-21* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☒ The drawing(s) filed on *08 February 2002* is/are: a)☒ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. §§ 119 and 120

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

13)☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. § 119(e) (to a provisional application) since a specific reference was included in the first sentence of the specification or in an Application Data Sheet. 37 CFR 1.78.

a) ☐ The translation of the foreign language provisional application has been received.

14)☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. §§ 120 and/or 121 since a specific reference was included in the first sentence of the specification or in an Application Data Sheet. 37 CFR 1.78.

Attachment(s)

1) ☐ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO-1449) Paper No(s) _____.
4) ☐ Interview Summary (PTO-413) Paper No(s). _____.
5) ☐ Notice of Informal Patent Application (PTO-152)
6) ☐ Other: .

DETAILED ACTION

Drawings

1. The previous objection to the drawings based on Figure 7 not being labeled is Prior Art is withdrawn at this time in view of Applicant's comments related thereto in the response filed 10/31/2003 since Applicant is not admitting that Figure 7 is prior art.

Claim Rejections - 35 USC § 112

2. The text of those sections of Title 35, U.S. Code not included in this action can be found in a prior Office action.

3. Claims 1-19 and 21 are rejected under 35 U.S.C. 112, first paragraph, as failing to comply with the written description requirement. The claim(s) contains subject matter which was not described in the specification in such a way as to reasonably convey to one skilled in the relevant art that the inventor(s), at the time the application was filed, had possession of the claimed invention.

Specifically, claims 1, 7, 11, and 21 set forth the limitation "controlling the rate of advance such that the hole remains substantially a flat-bottomed hole as it is cut", or the similar limitation of "advancing the milling cutter longitudinally...while maintaining the hole substantially flat bottomed as the milling cutter advances". This or similar language is repeated in the specification on page 3, paragraph 8, last sentence. However, the specification does not describe what is meant by this limitation, i.e., does not describe what constitutes such a rate of advance, nor what constitutes a "substantially a flat bottomed hole".

Note that for the hole to be cut as claimed, the tool must advance through the workpiece, and thus as it advances, there are at least some times in the machining process wherein the hole

is not going to be completely flat-bottomed. For example, note that in orbital machining of a hole in general, inherently either the tool has to be used to machine the hole at one depth, then advanced, then used to machine the hole at a slightly deeper depth, or the tool has to be constantly advancing while orbiting, thus producing a spiral tool path. In any case, Applicant has not specified either method, and neither method allows for the hole to be constantly flat-bottomed during the cutting process. Also, in general in machining of the type described by Applicant, tools are not used to remove extremely large amounts of material at one time, i.e., are not fed to an extremely large depth into a workpiece for a single cut (see Tool and Manufacturing Engineers Handbook, Vol. 1, Machining, pp.10-50 through 10-61 and 12-114), and it is unclear from Applicant's specification what degree of feed produces a hole that remains "substantially flat-bottomed", since it would appear that variations from true flat in the hole bottom as the hole is machined due to typical feeding (described by Tool and Manufacturing Engineers Handbook, Vol. 1, Machining)of the tool would produce a "substantially flat-bottomed" hole, i.e., varying by no more that a few thousandths of an inch at any given time during the process.

4. Claims 1-21 are rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

The term "substantially flat-bottomed" in claims 1, 7, and 21, and the term "substantially constant depth" in claim 11 are relative terms which renders these claims indefinite. The terms "substantially flat-bottomed" and "substantially constant depth" is not defined by the claim, the specification does not provide a standard for ascertaining the requisite degree, and one of

ordinary skill in the art would not be reasonably apprised of the scope of the invention. See the above 112, first paragraph rejection of these claims for a more detailed explanation of why this limitation is an unclear relative term in the context of this application.

The term "brittle" in claims 12 and 20 is a relative term which renders these claims indefinite. The term "brittle" is not defined by the claim, the specification does not provide a standard for ascertaining the requisite degree, and one of ordinary skill in the art would not be reasonably apprised of the scope of the invention.

Claim Rejections - 35 USC § 103

5. Claims 1-3 and 7-8, and 10, as best understood, are rejected under 35 U.S.C. 103(a) as being unpatentable over any of U.S. Pat. No.'s 5,934,847 (Thelin, hereinafter, '847), 5,816,755 (Thelin, hereinafter '755), 5,685,674 (Taquist et al.), 5,641,252 (Eriksson et al., hereinafter, '252), or WO 94/17944 (hereinafter '944) in view of the teachings of Tool and Manufacturing Engineers Handbook, Vol. 1, Machining, pp. 10-50 through 10-61 and 12-144.

'847, '755, '252, Taquist et al., and '944 all teach orbital machining of a through-hole in a composite material utilizing a cylindrical tool smaller than the finished hole diameter.

For '847, see Figures 1A and 1B and col. 2, lines 13-15, for example.

For '755, see Figures 1A and 1B and col. 1, lines 31-33, for example.

For '252, see Figure 1C and col. 1, lines 14-35 and col. 4, lines 23-42, for example.

For Taquist et al., see Figure 3 and col. 1, lines 31-40 and col. 2, lines 58-62, for example.

Regarding '944, see page 1, lines 1-7, page 4, lines 24-26, page 7, lines 19-25, and Figures 1-3, for example.

However, each of the aforedescribed references ('847, '755, '252, Taquist et al., and '944) is silent as to the particular rate of longitudinal advance of the cutter (which longitudinal advance rate determines whether the hole remains "substantially flat-bottomed" during the advance of the cutter). Additionally, regarding claims 2-3, none of '847, '755, '252, Taquist et al., and '944 specifically teach that the composite material is a "ceramic matrix composite material", nor that the composite material is a "silicon carbide/silicon carbide composite material".

Regarding the rate of advance and the "flat-bottomed hole", however, as evidenced by the teachings of Tool and Manufacturing Engineers Handbook, Vol. 1, Machining, the longitudinal feed rate in a milling operation is selected based on a number of factors, such as the material being cut and the available power of the milling machine (see page 10-16, for example). Additionally, Tool and Manufacturing Engineers Handbook, Vol. 1, Machining teaches that in general "lower feeds are needed for cutting harder materials" (page 10-60), and provides various feed rates to try with various materials, see Table 10-8. Noting that all of the feed rates listed would create an advance of the tool wherein the tool is only advanced at most a few thousandths of an inch at a time, which would appear, as best understood, to create a hole that remains "substantially flat-bottomed" as cut.

Therefore, it would have been obvious to one having ordinary skill in the art at the time the invention was made to have utilized one of the specific "lower feeds" taught by the teachings of Tool and Manufacturing Engineers Handbook, Vol. 1, Machining, to machine the harder "composite material" claimed by Applicant and taught by '252 and '281, for the purposes of

maintaining a maximum cutting life of the tool (see pages 10-53 and 10-60), thus saving cost and also saving time by decreasing the amount of time that is spent changing tools.

Regarding claims 2-3, it would have been obvious to one having ordinary skill in the art at the time the invention was made to have made the composite material taught by each of the described references whatever type of composite material, such as "ceramic matrix" or "silicon carbide/silicon carbide" as was desired or expedient to an end user, since it has been held to be within the general skill of a worker in the art to select a known material on the basis of its suitability for the intended use as a matter of obvious design choice, particularly since Applicant has not ascribed any particular criticality to the use of a "ceramic matrix" composite, or to a "silicon carbide/silicon carbide" composite (see page 2, paragraph 6, which states that the "approach may be used with a wide variety of composite materials", for example). In re Leshin, 125 USPQ 416. See also Ballas Liquidating Co. v. Allied industries of Kansas, Inc. (DC Kans) 205 USPQ 331.

6. Claims 1-3 and 7-9, as best understood, are rejected under 35 U.S.C. 103(a) as being unpatentable over either of U.S. Pat. No.'s 6,007,281 (Eriksson et al., hereinafter '281) or 5,641,252 (Eriksson et al., hereinafter, '252) in view of the teachings of Tool and Manufacturing Engineers Handbook, Vol. 1, Machining, pp. 10-50 through 10-61 and 12-144.

'281 and '252 both teach orbital machining of a blind-hole in a composite material utilizing a cylindrical tool smaller than the finished hole diameter.

For '281, see Figures 5-6, col. 8, lines 29-34, col. 4, lines 9-11, and particularly regarding claim 9, see col. 6, lines 31-33, for example.

For '252, see Figure 1C and col. 1, lines 14-35 and col. 4, lines 23-42, for example. Specifically regarding claim 9, see Figure 1D.

However, each of the aforedescribed references ('281 and '252) is silent as to the particular rate of longitudinal advance of the cutter (which longitudinal advance rate determines whether the hole remains "substantially flat-bottomed" during the advance of the cutter). Additionally, regarding claims 2-3, neither of '281 or '252 specifically teaches that the composite material is a "ceramic matrix composite material", nor that the composite material is a "silicon carbide/silicon carbide composite material".

Regarding the rate of advance and the "flat-bottomed hole", however, as evidenced by the teachings of Tool and Manufacturing Engineers Handbook, Vol. 1, Machining, the longitudinal feed rate in a milling operation is selected based on a number of factors, such as the material being cut and the available power of the milling machine (see page 10-16, for example). Additionally, Tool and Manufacturing Engineers Handbook, Vol. 1, Machining teaches that in general "lower feeds are needed for cutting harder materials" (page 10-60), and provides various feed rates to try with various materials, see Table 10-8. Noting that all of the feed rates listed would create an advance of the tool wherein the tool is only advanced at most a few thousandths of an inch at a time, which would appear, as best understood, to create a hole that remains "substantially flat-bottomed" as cut.

Therefore, it would have been obvious to one having ordinary skill in the art at the time the invention was made to have utilized one of the specific "lower feeds" taught by the teachings of Tool and Manufacturing Engineers Handbook, Vol. 1, Machining, to machine the harder "composite material" claimed by Applicant and taught by '252 and '281, for the purposes of

maintaining a maximum cutting life of the tool (see pages 10-53 and 10-60), thus saving cost and also saving time by decreasing the amount of time that is spent changing tools.

Regarding claims 2-3, it would have been obvious to one having ordinary skill in the art at the time the invention was made to have made the composite material taught by each of the described references whatever type of composite material, such as "ceramic matrix" or "silicon carbide/silicon carbide" as was desired or expedient to an end user, since it has been held to be within the general skill of a worker in the art to select a known material on the basis of its suitability for the intended use as a matter of obvious design choice, particularly since Applicant has not ascribed any particular criticality to the use of a "ceramic matrix" composite, or to a "silicon carbide/silicon carbide" composite (see page 2, paragraph 6, which states that the "approach may be used with a wide variety of composite materials", for example). In re Leshin, 125 USPQ 416. See also Ballas Liquidating Co. v. Allied industries of Kansas, Inc. (DC Kans) 205 USPQ 331.

7. Claim 4, as best understood, is rejected under 35 U.S.C. 103(a) as being unpatentable over any of U.S. Pat. No.'s 5,934,847 (Thelin, hereinafter, '847), 5,816,755 (Thelin, hereinafter '755), 5,685,674 (Taquist et al.), 6,007,281 (Eriksson et al., hereinafter '281) or 5,641,252 (Eriksson et al., hereinafter, '252)or WO 94/17944 (hereinafter '944) in view of the teachings of Tool and Manufacturing Engineers Handbook, Vol. 1, Machining, pp. 10-50 through 10-61 and 12-144, as applied to claim 1 above, and further in view of German Patent Document 19920365 A1 (hereinafter '365).

Each of '847, '755, Taquist et al., '281, '252, and '944 in view of the teachings of Tool and Manufacturing Engineers Handbook, Vol. 1, Machining teaches all aspects of the claimed

invention as described in the above rejection based thereon, but each of '847, '755, Taquist et al., '281, '252, and '944 is silent as to how the workpiece is held for machining.

'365 teaches a holding device for a workpiece (see Figures 1-2, for example), wherein a thermosetting adhesive is used to affix the workpiece to a carrier, and where the workpiece is removed from the carrier upon completion of the machining (see abstract). Additionally, '365 teaches that such holding serves to hold a workpiece "precisely in registration on a carrier for machining or other precision operations, afterwards separating them", and further teaches that such holding "avoids all form of surface damage or impairment", see abstract, for example.

Therefore, it would have been obvious to one having ordinary skill in the art at the time the invention was made to have utilized the thermosetting adhesive device and method taught by '365 to hold the workpieces taught by any of '847, '755, Taquist et al., '281, '252, and '944 for the purposes of holding the workpieces precisely in registration, thereby increasing the machining accuracy, and for providing a holding technique that "avoids all form of surface damage or impairment", as taught by '365.

8. Claims 4-6, as best understood, are rejected under 35 U.S.C. 103(a) as being unpatentable over WO 94/17944 (hereinafter '944) in view of the teachings of Tool and Manufacturing Engineers Handbook, Vol. 1, Machining, pp. 10-50 through 10-61 and 12-144, as applied to claim 1 above, and further in view of U.S. Pat. No. 3,917,249 (Constantine).

'944 in view of the teachings of Tool and Manufacturing Engineers Handbook, Vol. 1, Machining teaches all aspects of the claimed invention as described in the above rejection based thereon, but '944 is silent as to how the workpiece is held for machining.

Constantine teaches machining of a complex workpiece 18 (Figures 1 and 16-17, col. 3, lines 10-19) wherein the workpiece is mounted in place for machining by a thermoplastic epoxy resin adhesive in order to achieve rigid mounting (col. 3, lines 10-19). The workpiece is supported by "non-planar backing fixtures" or support members 210 that are conformed to the shape of the under-side of the workpiece (Figures 16-17 and 21-22, and the adhesive 242 or 244 is placed on the support members 210 to mount the workpiece thereon (Figures 16-17, 21-22, for example). Constantine further teaches removing the workpiece from the "backing fixtures" upon the completion of machining (see col. 12, lines 37-52, for example).

Therefore, it would have been obvious to one having ordinary skill in the art at the time the invention was made to have utilized the adhesive and non-planar backing fixture that conforms to the workpiece concept taught by Constantine to hold the non-planar workpiece '944 (see Figures 1-3) for the purpose providing a rigid way of holding the workpiece taught by '944 (as taught by Constantine, see col. 3, lines 10-19), thereby increasing the machining accuracy of '944's device.

9. Claims 11-14 and 17-18, as best understood, are rejected under 35 U.S.C. 103(a) as being unpatentable over either of U.S. Pat. No.'s 6,007,281 (Eriksson et al., hereinafter '281) or 5,641,252 (Eriksson et al., hereinafter, '252) in view of German Patent Document 19920365 A1 (hereinafter '365) and in view of the teachings of Tool and Manufacturing Engineers Handbook, Vol. 1, Machining, pp. 10-50 through 10-61 and 12-144.

Each of the above references teaches orbital machining of a blind-hole in a composite material utilizing a cylindrical tool smaller than the finished hole diameter.

For '281, see Figures 5-6, col. 8, lines 29-34, col. 4, lines 9-11, and particularly regarding claim 9, see col. 6, lines 31-33, for example.

For '252, see Figure 1C and col. 1, lines 14-35 and col. 4, lines 23-42, for example. Specifically regarding claim 18, see Figure 1D.

Each of '252 and '281, teaches all aspects of the claimed invention as described in the above rejection based thereon, but each of these references is silent as to how the workpiece is held for machining. Additionally, regarding claims 12-13, each of these references teaches machining a composite material, but does not specifically teach that the composite material is a "ceramic matrix composite material", nor that the ceramic composite matrix material has a "brittle" ceramic matrix, nor that the composite material is a "silicon carbide/silicon carbide composite material". Also, each of these references is silent as to the particular rate of longitudinal advance of the cutter (which longitudinal rate of advance determines whether the hole is "substantially flat-bottomed" or has a "substantially constant depth" during machining).

'365 teaches a holding device for a workpiece (see Figures 1-2, for example), wherein a thermosetting adhesive is used to affix the workpiece to a carrier, and where the workpiece is removed from the carrier upon completion of the machining (see abstract). Additionally, '365 teaches that such holding serves to hold a workpiece "precisely in registration on a carrier for machining or other precision operations, afterwards separating them", and further teaches that such holding "avoids all form of surface damage or impairment", see abstract, for example.

Also, as evidenced by the teachings of Tool and Manufacturing Engineers Handbook, Vol. 1, Machining, the longitudinal feed rate in a milling operation is selected based on a number of factors, such as the material being cut and the available power of the milling machine (see

page 10-16, for example). Additionally, Tool and Manufacturing Engineers Handbook, Vol. 1, Machining teaches that in general "lower feeds are needed for cutting harder materials" (page 10-60), and provides various feed rates to try with various materials, see Table 10-8. Noting that all of the feed rates listed would create an advance of the tool wherein the tool is only advanced at most a few thousandths of an inch at a time, which would appear, as best understood, to create a hole that remains "substantially flat-bottomed" as cut.

Regarding the holding of the workpiece, therefore, it would have been obvious to one having ordinary skill in the art at the time the invention was made to have utilized the thermosetting adhesive device and method taught by '365 to hold the workpieces taught by either of '252 or '281 for the purposes of holding the workpieces precisely in registration, thereby increasing the machining accuracy, and for providing a holding technique that "avoids all form of surface damage or impairment", as taught by '365.

Additionally, regarding the workpiece material, it would have been obvious to one having ordinary skill in the art at the time the invention was made to have made the composite material taught by each of the described references whatever type of composite material, such as "ceramic matrix" or "brittle ceramic matrix" or "silicon carbide/silicon carbide" as was desired or expedient to an end user, since it has been held to be within the general skill of a worker in the art to select a known material on the basis of its suitability for the intended use as a matter of obvious design choice, particularly since Applicant has not ascribed any particular criticality to the use of a "brittle ceramic matrix", a "ceramic matrix" composite, or to a "silicon carbide/silicon carbide" composite (see page 2, paragraph 6, which states that the "approach may

be used with a wide variety of composite materials", for example). In re Leshin, 125 USPQ 416. See also Ballas Liquidating Co. v. Allied industries of Kansas, Inc. (DC Kans) 205 USPQ 331.

Also, regarding the feed rate of the tool, therefore, it would have been obvious to one having ordinary skill in the art at the time the invention was made to have utilized one of the specific "lower feeds" taught by the teachings of Tool and Manufacturing Engineers Handbook, Vol. 1, Machining, to machine the harder "composite material" claimed by Applicant and taught by each of '252 and '281, for the purposes of maintaining a maximum cutting life of the tool (see pages 10-53 and 10-60), thus saving cost and also saving time by decreasing the amount of time that is spent changing tools.

10. Claims 11-14, 17, and 19, as best understood, are rejected under 35 U.S.C. 103(a) as being unpatentable over any of U.S. Pat. No.'s 5,934,847 (Thelin, hereinafter, '847), 5,816,755 (Thelin, hereinafter '755), 5,641,252 (Eriksson et al., hereinafter '252), 5,685,674 (Taquist et al.), or WO 94/17944 (hereinafter '944) in view of German Patent Document 19920365 A1 (hereinafter '365) and in view of the teachings of Tool and Manufacturing Engineers Handbook, Vol. 1, Machining, pp. 10-50 through 10-61 and 12-144.

All of the above references teach orbital machining of a through-hole in a composite material utilizing a cylindrical tool smaller than the finished hole diameter.

For '847, see Figures 1A and 1B and col. 2, lines 13-15, for example.

For '755, see Figures 1A and 1B and col. 1, lines 31-33, for example.

For '252, see Figure 1C and col. 1, lines 14-35 and col. 4, lines 23-42, for example.

For Taquist et al., see Figure 3 and col. 1, lines 31-40 and col. 2, lines 58-62, for example.

Regarding '944, see page 1, lines 1-7, page 4, lines 24-26, page 7, lines 19-25, and Figures 1-3, for example.

Each of '847, '755, '252, Taquist et al., and '944 teaches all aspects of the claimed invention as described in the above rejection based thereon, but each of these references is silent as to how the workpiece is held for machining. Additionally, regarding claims 12-13, each of these references teaches machining a composite material, but does not specifically teach that the composite material is a "ceramic matrix composite material", nor that the ceramic matrix composite material has a "brittle ceramic matrix", nor that the composite material is a "silicon carbide/silicon carbide composite material". Also, each of these references is silent as to the particular rate of longitudinal advance of the cutter (which rate determines whether or not the hole remains "substantially flat bottomed" as it is cut).

'365 teaches a holding device for a workpiece (see Figures 1-2, for example), wherein a thermosetting adhesive is used to affix the workpiece to a carrier, and where the workpiece is removed from the carrier upon completion of the machining (see abstract). Additionally, '365 teaches that such holding serves to hold a workpiece "precisely in registration on a carrier for machining or other precision operations, afterwards separating them", and further teaches that such holding "avoids all form of surface damage or impairment", see abstract, for example.

Also, as evidenced by the teachings of Tool and Manufacturing Engineers Handbook, Vol. 1, Machining, the longitudinal feed rate in a milling operation is selected based on a number of factors, such as the material being cut and the available power of the milling machine (see page 10-16, for example). Additionally, Tool and Manufacturing Engineers Handbook, Vol. 1, Machining teaches that in general "lower feeds are needed for cutting harder materials" (page

10-60), and provides various feed rates to try with various materials, see Table 10-8. Noting that all of the feed rates listed would create an advance of the tool wherein the tool is only advanced at most a few thousandths of an inch at a time, which would appear, as best understood, to create a hole that remains "substantially flat-bottomed" as cut.

Regarding the holding of the workpiece, therefore, it would have been obvious to one having ordinary skill in the art at the time the invention was made to have utilized the thermosetting adhesive device and method taught by '365 to hold the workpieces taught by any of '847, '755, '252, Taquist et al., and '944 for the purposes of holding the workpieces precisely in registration, thereby increasing the machining accuracy, and for providing a holding technique that "avoids all form of surface damage or impairment", as taught by '365.

Additionally, regarding the workpiece material, it would have been obvious to one having ordinary skill in the art at the time the invention was made to have made the composite material taught by each of the described references whatever type of composite material, such as "ceramic matrix" or "silicon carbide/silicon carbide" as was desired or expedient to an end user, since it has been held to be within the general skill of a worker in the art to select a known material on the basis of its suitability for the intended use as a matter of obvious design choice, particularly since Applicant has not ascribed any particular criticality to the use of a "ceramic matrix" composite, or to a "silicon carbide/silicon carbide" composite (see page 2, paragraph 6, which states that the "approach may be used with a wide variety of composite materials", for example). In re Leshin, 125 USPQ 416. See also Ballas Liquidating Co. v. Allied industries of Kansas, Inc. (DC Kans) 205 USPQ 331.

Also, regarding the feed rate of the tool, therefore, it would have been obvious to one having ordinary skill in the art at the time the invention was made to have utilized one of the specific "lower feeds" taught by the teachings of Tool and Manufacturing Engineers Handbook, Vol. 1, Machining, to machine the harder "composite material" claimed by Applicant and taught by each of '847, '755, '252, Taquist et al., and '944, for the purposes of maintaining a maximum cutting life of the tool (see pages 10-53 and 10-60), thus saving cost and also saving time by decreasing the amount of time that is spent changing tools.

11. Claims 11-17, and 19, as best understood, are rejected under 35 U.S.C. 103(a) as being unpatentable over WO 94/17944 (hereinafter '944) in view of U.S. Pat. No. 3,917,249 (Constantine) and in view of the teachings of Tool and Manufacturing Engineers Handbook, Vol. 1, Machining, pp. 10-50 through 10-61 and 12-144.

'944 teaches orbital machining of a through-hole in a composite material utilizing a cylindrical tool smaller than the finished hole diameter. See page 1, lines 1-7, page 4, lines 24-26, page 7, lines 19-25, and Figures 1-3, for example.

'944 teaches all aspects of the claimed invention as described in the above rejection based thereon, but is silent as to how the workpiece is held for machining. Additionally, regarding claims 12-13, '944 teaches machining a composite material, but does not specifically teach that the composite material is a "ceramic matrix composite material", nor that the ceramic matrix composite material has a "brittle" ceramic matrix, nor that the composite material is a "silicon carbide/silicon carbide composite material". Also, '944 is silent as to the particular rate of longitudinal advance of the cutter (which longitudinal rate of advance determines whether or not the hole remains "substantially flat-bottomed" as cut).

Constantine teaches machining of a complex workpiece 18 (Figures 1 and 16-17, col. 3, lines 10-19) wherein the workpiece is mounted in place for machining by a thermoplastic epoxy resin (adhesive) in order to achieve rigid mounting (col. 3, lines 10-19). The workpiece is supported by "non-planar backing fixtures" or support members 210 that are conformed to the shape of the under-side of the workpiece (Figures 16-17 and 21-22, and the adhesive 242 or 244 is placed on the support members 210 to mount the workpiece thereon (Figures 16-17, 21-22, for example). Additionally note that Constantine teaches removing the workpiece from the "backing fixture" upon completion of machining (see col. 12, lines 37-52, for example).

Also, as evidenced by the teachings of Tool and Manufacturing Engineers Handbook, Vol. 1, Machining, the longitudinal feed rate in a milling operation is selected based on a number of factors, such as the material being cut and the available power of the milling machine (see page 10-16, for example). Additionally, Tool and Manufacturing Engineers Handbook, Vol. 1, Machining teaches that in general "lower feeds are needed for cutting harder materials" (page 10-60), and provides various feed rates to try with various materials, see Table 10-8. Noting that all of the feed rates listed would create an advance of the tool wherein the tool is only advanced at most a few thousandths of an inch at a time, which would appear, as best understood, to create a hole that remains "substantially flat-bottomed" as cut.

Regarding the holding of the workpiece, therefore, it would have been obvious to one having ordinary skill in the art at the time the invention was made to have utilized the adhesive and non-planar backing fixture that conforms to the workpiece concept taught by Constantine to hold the non-planar workpiece '944 (see Figures 1-3) for the purpose providing a rigid way of

holding the workpiece taught by '944 (as taught by Constantine, see col. 3, lines 10-19), thereby increasing the machining accuracy of '944's device.

Additionally, regarding the workpiece material, it would have been obvious to one having ordinary skill in the art at the time the invention was made to have made the composite material taught by each of the described references whatever type of composite material, such as "ceramic matrix" or "silicon carbide/silicon carbide" as was desired or expedient to an end user, since it has been held to be within the general skill of a worker in the art to select a known material on the basis of its suitability for the intended use as a matter of obvious design choice, particularly since Applicant has not ascribed any particular criticality to the use of a "ceramic matrix" composite, or to a "silicon carbide/silicon carbide" composite (see page 2, paragraph 6, which states that the "approach may be used with a wide variety of composite materials", for example). In re Leshin, 125 USPQ 416. See also Ballas Liquidating Co. v. Allied industries of Kansas, Inc. (DC Kans) 205 USPQ 331.

Also, regarding the feed rate of the tool, therefore, it would have been obvious to one having ordinary skill in the art at the time the invention was made to have utilized one of the specific "lower feeds" taught by the teachings of Tool and Manufacturing Engineers Handbook, Vol. 1, Machining, to machine the harder "composite material" claimed by Applicant and taught by '944, for the purposes of maintaining a maximum cutting life of the tool (see pages 10-53 and 10-60), thus saving cost and also saving time by decreasing the amount of time that is spent changing tools.

12. Claim 20, as best understood, is rejected under 35 U.S.C. 103(a) as being unpatentable over any of U.S. Pat. No.'s 5,934,847 (Thelin, hereinafter, '847), 5,816,755 (Thelin, hereinafter

'755), 5,685,674 (Taquist et al.), 5,641,252 (Eriksson et al., hereinafter, '252), or WO 94/17944 (hereinafter '944), or U.S. Pat. No.'s 6,007,281 (Eriksson et al., hereinafter '281) in view of DE 199 20 365 (hereinafter '365).

Each of '847, '755, Taquist et al., '252, '944, and '281 teaches orbital machining of a hole in a composite material utilizing a cylindrical tool smaller than the finished hole diameter as described above. Additionally, it is noted that each of these references teach orbital machining of a composite material that includes fibers embedded in a matrix.

See '847, col. 1, lines 10-12 and col. 2, lines 13-15, for example.

See '755, col. 1, lines 31-34 and col. 2, lines 15-17, for example.

See Taquist et al., col. 1, lines 31-40, for example.

See '252, abstract and col. 1, lines 14-31, for example.

See '944, page 1, line 10 through page 2, line 1, for example.

See '281, col. 5, lines 48-55, for example.

However, even though each of '847, '755, Taquist et al., '252, '944, and '281 teaches orbital machining a fiber-reinforced composite material, none of these specifically teach that the composite material is a "ceramic matrix composite material", nor that the ceramic matrix composite material has a "brittle" ceramic matrix.

Regarding the holding of the workpiece, '365 teaches a holding device for a workpiece (see Figures 1-2, for example), wherein a thermosetting adhesive is used to affix the workpiece to a carrier, and where the workpiece is removed from the carrier upon completion of the machining (see abstract). Additionally, '365 teaches that such holding serves to hold a workpiece "precisely in registration on a carrier for machining or other precision operations,

afterwards separating them", and further teaches that such holding "avoids all form of surface damage or impairment", see abstract, for example.

Regarding the holding of the workpiece, therefore, it would have been obvious to one having ordinary skill in the art at the time the invention was made to have utilized the thermosetting adhesive device and method taught by '365 to hold the workpieces taught by any of '847, '755, Taquist et al., '252, '944, and '281 for the purposes of holding the workpieces precisely in registration, thereby increasing the machining accuracy, and for providing a holding technique that "avoids all form of surface damage or impairment", as taught by '365.

Additionally, regarding the workpiece material, it would have been obvious to one having ordinary skill in the art at the time the invention was made to have made the composite material taught by each of the described references whatever type of composite material, such as "ceramic matrix" or one with a "brittle ceramic matrix" as was desired or expedient to an end user, since it has been held to be within the general skill of a worker in the art to select a known material on the basis of its suitability for the intended use as a matter of obvious design choice, particularly since Applicant has not ascribed any particular criticality to the use of a "ceramic matrix" composite, or to a "brittle ceramic matrix" composite (see page 2, paragraph 6, which states that the "approach may be used with a wide variety of composite materials", for example). In re Leshin, 125 USPQ 416. See also Ballas Liquidating Co. v. Allied industries of Kansas, Inc. (DC Kans) 205 USPQ 331.

13. Claim 21, as best understood, is rejected under 35 U.S.C. 103(a) as being unpatentable over any of U.S. Pat. No.'s 5,934,847 (Thelin, hereinafter, '847), 5,816,755 (Thelin, hereinafter '755), 5,685,674 (Taquist et al.), 5,641,252 (Eriksson et al., hereinafter, '252), or WO 94/17944

(hereinafter '944), or U.S. Pat. No.'s 6,007,281 (Eriksson et al., hereinafter '281) in view of DE 199 20 365 (hereinafter '365) as applied to claim 20 above, and further in view of the teachings of Tool and Manufacturing Engineers Handbook, Vol. 1, Machining, pp. 10-50 through 10-61 and 12-144.

Each of '847, '755, Taquist et al., '252, '944, and '281 in view of '395 teaches all aspects of the claimed invention as described in the above rejection based thereon, but each is silent as to the particular rate of longitudinal advance of the cutter (which longitudinal rate of advance determines whether or not the hole remains "substantially flat-bottomed" as cut).

However, as evidenced by the teachings of Tool and Manufacturing Engineers Handbook, Vol. 1, Machining, the longitudinal feed rate in a milling operation is selected based on a number of factors, such as the material being cut and the available power of the milling machine (see page 10-16, for example). Additionally, Tool and Manufacturing Engineers Handbook, Vol. 1, Machining teaches that in general "lower feeds are needed for cutting harder materials" (page 10-60), and provides various feed rates to try with various materials, see Table 10-8. Noting that all of the feed rates listed would create an advance of the tool wherein the tool is only advanced at most a few thousandths of an inch at a time, which would appear, as best understood, to create a hole that remains "substantially flat-bottomed" as cut.

Therefore, it would have been obvious to one having ordinary skill in the art at the time the invention was made to have utilized one of the specific "lower feeds" taught by the teachings of Tool and Manufacturing Engineers Handbook, Vol. 1, Machining, to machine the harder "composite material" claimed by Applicant and taught by '944, for the purposes of maintaining a

maximum cutting life of the tool (see pages 10-53 and 10-60), thus saving cost and also saving time by decreasing the amount of time that is spent changing tools.

Response to Arguments

14. Applicant's arguments filed October 31, 2003 have been fully considered but they are not persuasive. Many of Applicant's arguments have been considered but are moot in view of the new ground(s) of rejection, and accordingly, applicant's attention is directed to the above rejections. However, Examiner will address those arguments which still pertain.

15. Applicant has asserted the following:

> As explained in detail in para. [002 8]-[0029] of the present Specification, the millingcutter is used to cut a small distance longitudinally into the article and moved laterally to enlarge the hole to its full size; then the milling cutter is used to cut a further small distance longitudinally into the article and moved laterally to enlarge the hole to its full size; and so on. The longitudinal movement may be continuous or sequential, but the bottom of the hole remains substantially flat.
>
> As to claim 7, the words that make up the phrase are used in their conventional meanings. A "hole" is a "hollow place in a solid body or mass". The "bottom" is the "lowest or deepest part of anything, as distinguished from the top". "Flat" is "level, even, or without inequalities of surface" and "having a generally level shape or appearance~~. "Substantially" is the adverb corresponding to the meaning of "substantial", "of or pertaining to the essence of a thing" (i.e., essentially). All of these definitions come from Webster's Encyclopedic Unabridged Dictionary of the English Language. See also the body of the present application, such as para. [0029].

However, Examiner notes that even as described by Applicant, the hole still does not remain "flat" (or "level, even, or without inequalities of surface") as it is machined. Note that since the cutter is smaller than the hole, as the cutter is fed to a deeper depth, regardless of how this "deepening movement" occurs, it creates a portion of the hole that is at a deeper depth than the rest of the bottom of the hole. Thus, the hole is not "level, even, or without inequalities of surface" or "flat". Thus, it is left to one to "figure out" what degree of flat constitutes

"substantially" flat. In the context of this specific application, where it is clear that there is no circumstance where it is possible that the hole be maintained completely flat during its machining, it is unclear from the specification as originally filed what degree of flatness constitutes "substantially flat" as set forth in claim 1, for example, and it is further unclear from the specification as originally filed what "rate of longitudinal advance" would create such a "substantially flat" hole bottom as set forth in claim 7, for example. Additionally note that feeding the cutter longitudinally with any of the advisable feeds from the "Handbook" (as described in the above rejections based thereon) would result in the deepening movement only being on the order of a few thousandths of an inch, which would appear to create a deepened amount in the hole bottom that is small enough that the hole bottom would still be considered "substantially flat", thus further rendering the meaning of such term, or any similar such term, unclear.

Applicant has further asserted the following:

> The phrase in claim Applicant suspects that the Examiner's concern is with the meaning of "substantially" in "substantially flat". A search of the PTO database since 1975 shows that the term "substantially flat" appears in 53,099 issued patents (as of October 20, 2003). The term "substantially flat" appears in the claims of 22,992 issued patents (as of October 20, 2003). Applicant reviewed a sample of these 22,992 issued patents that use "substantially flat" in the claims, and in no cases reviewed by Applicant was the term "substantially flat" further defined in the patent. Two examples are U.S. patents 4,772,376 and 6,633,643. Those skilled in the art understand this phraseology.
>
> In short, the term "substantially flat" is widely used and well understood in the patent community and in the art.
>
> The phrase in claim 7, "controlling the rate of longitudinal advance such that the hole remains substantially a flat-bottomed hole as it is cut", means what it plainly says.
>
> The rate of longitudinal advance of the cutter into the workpiece maintains "substantially a flat-bottomed hole". Applicant cannot state a specific rate of advance that is applicable

> to all composite materials, as the specific rate of advance to maintain the substantially flat-bottomed hole will depend upon the specific composite material being cut.

However, firstly, it is noted that it appears that Applicant is attempting to interpret the per se term "substantially flat" in a vacuum, rather than in the context of this application. Whether or not the term "substantially flat" in the other 53,099 issued patents referenced by Applicant is clear in that patent has no bearing on whether the term is clear **in the context of this case**. It is further noted that Examiner has provided reasons that are particular to the circumstances of this case as to why the term is unclear.

Regarding Applicant's contention that "Applicant cannot state a specific rate of advance that is applicable to all composite materials, as the specific rate of advance to maintain the substantially flat-bottomed hole will depend upon the specific composite material being cut", it is noted that there would appear to have been no reason that Applicant could not have provided a quantifiable amount or degree of "flatness" that would apply to any material, so that it would be clear as to what degree of flatness constitutes "substantially flat".

Regarding Applicant's assertion with respect to claims 11-19 that "the term 'substantially a flat-bottomed hole' or the like does not appear in these claims". However, it is noted that the limitation "such that the hole has a substantially constant depth over its entire area as it cut" is found in claim 11, which similar limitation is unclear for the same reasons provided for "substantially flat-bottomed".

With respect to the material of the workpiece, Applicant has asserted the following:

> To say that, "Applicant has not ascribed any particular criticality to the use of a "ceramic matrix" composite, or to a "silicon carbide/silicon carbide" composite is to ignore the discussion at para. [0021], [0022], [0029], and [0030] of the Specification. Applicant addressed the special nature of these composite materials and the resulting difficulties in cutting holes in them in detail. The present approach may be used with other composite

> materials, but other approaches may not be used with ceramic matrix composite materials and particularly silicon carbide/silicon carbide composite materials.

However, this is not persuasive. It is true that the specification does teach advantages of applying the known (as set forth in detail in this and the preceding office action) method of orbitally machining a hole in a fiber-reinforced composite workpiece to a particular workpiece material, and specifically to a ceramic matrix composite or a silicon carbide/silicon carbide composite. However, Applicant admitted above that "the present approach may be used with other materials" and it was also specifically set forth in the specification that the orbital machining method "may be used with a wide variety of composite materials". Regardless of Applicant's contentions to the contrary, the courts have held that it is within the general skill of a worker in the art to select a known material on the basis of its suitability for the intended use as a matter of obvious design choice. In re Leshin, 125 USPQ 416. See also Ballas Liquidating Co. v. Allied industries of Kansas, Inc. (DC Kans) 205 USPQ 331. It is noted that ceramic matrix composites are known materials, and that a silicon carbide/silicon carbide composite is a known material, as evidenced by at least U.S. Pat. No. 5,448,041 (Benoit et al., see columns 2-3), cited by Applicant. Particularly since the base references relied upon in the art rejections provide teachings of specifically orbitally machining a fiber-reinforced composite (note for example that at least many of the references used are not limited to "polymer-matrix composites" as asserted by Applicant on page 11 of the response, see for example '847, which is merely limited to a generic "fiber-reinforced composite", col. 1, lines 8-11 and col. 2, lines 13-16, for example), there appears to be no reason why it would not be

obvious to substitute a specific known material (e.g., ceramic matrix composite or silicon carbide/silicon carbide composite) for a generic material, and specifically to have substituted a specific known fiber reinforced composite for a generic fiber-reinforced composite. Put another way, there appears to be no reason why it would not be an obvious matter of design choice to apply a known method previously applied to a generic material to a specific known material.

Applicant has asserted that they need a full translation of the DE '365 reference to be able to "fully respond to this ground of rejection" because "[a]s it is now, Applicant cannot tell if DE '365 relates to composite materials, or to the flat-bottomed hole-cutting technology to which claims 4-6 relate". However, firstly, in response to applicant's arguments against the references individually, one cannot show nonobviousness by attacking references individually where the rejections are based on combinations of references. See *In re Keller*, 642 F.2d 413, 208 USPQ 871 (CCPA 1981); *In re Merck & Co.*, 800 F.2d 1091, 231 USPQ 375 (Fed. Cir. 1986). It is noted that the DE '365 reference was not relied upon in any of the rejections that were based thereon for any teaching of "composite materials" or "flat-bottomed hole cutting". Instead, DE '365 was relied upon to teach a specific type of work holding means. All of the base references were silent about how the workpiece was held, and DE '365 clearly teaches, from the pictures and the English abstract provided to Applicant, a device and method for holding a workpiece with the particular type of work holding claimed, and further explicitly teaches (in the English abstract provided to Applicant) a benefit of such a work holding arrangement. Thus, to substitute a specific type of workholder that has a described benefit for the generic workholder implicit in each of the base references would have been obvious to one having ordinary skill in

the art for the purpose of achieving the described benefit, as would all be readily evident from the Figures of the German reference as well as the English abstract. Thus, Examiner established a prima facie case of obviousness based on the German reference from the Figures and the English abstract, and thus the burden shifted to Applicant to rebut that prima facie case. If it is necessary for Applicant to obtain an English translation of the document to somehow overcome this prima facie case, the burden is on Applicant to do so. Thus Applicant's request to make this a non-final action so that an English translation of the German patent can be provided to Applicant is not persuasive, since the prima facie case was made with the clear figures and English abstract of the German reference.

Applicant has asserted that the "Handbook" deals "with the conventional milling of metals (see tables 10-5, 10-7, 10-8, and 12-56, for example) and not with the cutting of holes in composite materials". However, this is not persuasive. The Handbook was merely relied upon to show that in general, recommended feed rates in milling operations for whatever the material is are on the order of a few thousandths of an inch. Note that the Handbook provides guidelines of feeds to try for particular materials, some of which are metal, but also specifically teaches that the feed "varies to suit the job" (page 12-114), that the feed rate is dependent upon the material being cut (page 10-50 and page 10-53, for example). Furthermore, as specifically set forth in the preceding office action as well as above, the Handbook teaches that in general "lower feeds are needed for cutting harder materials" (page 10-60, right column, line 6), and provides various feed rates to try with various materials, see Table 10-8. Noting that all of the feed rates listed would create an advance of the tool wherein the tool is only advanced at most a few thousandths of an inch at a time, it would appear, as best understood, that any advisable feed rate would serve

to create a hole that remains "substantially flat-bottomed", i.e., one that only has variations from flat by as much as the feed, on the order of a few thousandths of an inch.

Regarding Applicant's assertions that the Handbook doesn't teach the hole cutting of the present invention, it is noted that the Handbook wasn't relied upon for this feature. In response to applicant's arguments against the references individually, one cannot show nonobviousness by attacking references individually where the rejections are based on combinations of references. See *In re Keller*, 642 F.2d 413, 208 USPQ 871 (CCPA 1981); *In re Merck & Co.,* 800 F.2d 1091, 231 USPQ 375 (Fed. Cir. 1986).

In response to applicant's argument that the examiner's conclusion of obviousness is based upon improper hindsight reasoning, it must be recognized that any judgment on obviousness is in a sense necessarily a reconstruction based upon hindsight reasoning. But so long as it takes into account only knowledge which was within the level of ordinary skill at the time the claimed invention was made, and does not include knowledge gleaned only from the applicant's disclosure, such a reconstruction is proper. See *In re McLaughlin*, 443 F.2d 1392, 170 USPQ 209 (CCPA 1971). Applicant has provided detailed reasoning for all reference combinations, which reasoning either came from the references themselves, or from the knowledge of one of ordinary skill in the art, as set forth in detail in both the preceding office action as well as above.

Additionally, with respect to the previous rejection of claims 11-15, 17, and 19 under 35 USC 103 over WO '944 in view of Constantine and Handbook, Applicant has asserted (on page 19 of the response) that Applicant "can find no teaching" in the '944 reference of "controlling the rate of longitudinal advance such that the hole has a substantially constant depth over its

entire area as cut". However, it is noted that the '944 reference was not relied upon to teach this feature, which is why the Handbook teaching was provided as set forth in detail above. Again, in response to applicant's arguments against the references individually, one cannot show nonobviousness by attacking references individually where the rejections are based on combinations of references. See *In re Keller*, 642 F.2d 413, 208 USPQ 871 (CCPA 1981); *In re Merck & Co.*, 800 F.2d 1091, 231 USPQ 375 (Fed. Cir. 1986).

Conclusion

16. Applicant's amendment necessitated the new ground(s) of rejection presented in this Office action. Accordingly, **THIS ACTION IS MADE FINAL**. See MPEP § 706.07(a). Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

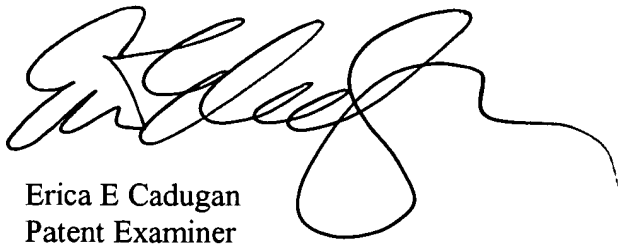
A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the date of this final action.

Faxing of Responses to Office Actions and Contact Information

17. In order to reduce pendency and avoid potential delays, TC 3700 is encouraging FAXing of responses to Office Actions directly into the Group at (703) 872-9306. This practice may be used for filing papers not requiring a fee. It may also be used for filing papers which require a

fee by applicants who authorize charges to a PTO deposit account. Please identify the examiner and art unit at the top of your cover sheet. Papers submitted via FAX into TC 3700 will be promptly forwarded to the examiner.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Erica Cadugan whose telephone number is (703) 308-6395. The examiner can normally be reached on Monday through Thursday from 7:30 a.m. to 5:00 p.m., and every other Friday from 7:30 a.m. to 4:00 p.m. If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, A.L. Wellington can be reached at (703) 308-2159. Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to the TC 3700 receptionist whose telephone number is (703) 308-1148.



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Art Unit 3722

eec
January 22, 2004